

In the Specification:

At page 1, after the title and before the first line, please insert the following paragraph:

--Cross Reference to Related Applications

This application is a division of U.S. Application Serial No. 09/598,811, filed June 21, 2000, which is a continuation-in-part of U.S. Application Serial No. 09/238,981, filed December 17, 1998, now abandoned, the entireties of which are incorporated herein by reference.--

Please replace the paragraph beginning at page 4, line 11, with the following rewritten paragraph:

FIG. 17 shows an arrangement of such a countermeasure. When the current, which flows to the an oxygen pump 260, is detected by using a current-detecting resistor Ra, the current supply from a variable power source 262 to the oxygen pump 260 is shunted by the aid of an adjusting resistor Rb (shunt resistor).

Please replace the heading beginning at page 17, line 5, with the following rewritten heading:

DETAILED DESCRIPTION OF THE INVENTIONPREFERRED EMBODIMENTS

Please replace the paragraph beginning at page 23, line 10, with the following rewritten paragraph:

A desired constant voltage Vp2 is applied between the auxiliary pumping electrode 50 and the reference electrode 38 of the auxiliary pumping cell 52 by the aid of an external power source 54. Thus, the oxygen in the atmosphere in the second chamber 26 can be pumped out to the reference gas-introducing space 18. Accordingly, the partial pressure of oxygen in the atmosphere in the second chamber 26 is controlled to have a low value of partial pressure of oxygen which does not substantially affect the measurement for the amount of the objective component under a condition in which the measurement gas component (NOx) is not substantially reduced or decomposed. In this arrangement, the change in amount of oxygen introduced into the second chamber 26 is greatly reduced as compared with the change in the measurement gas, owing to the operation of the main

pumping cell 32 for the first chamber 24. Accordingly, the partial pressure of oxygen in the second chamber 26 is controlled accurately and constantly.

Please replace the paragraph beginning at page 25, line 6, with the following rewritten paragraph:

Therefore, in the gas sensor 10A according to the first embodiment, the electromotive force-measuring circuit 70 measures constantly the electromotive force V2 generated between the detecting electrode 60 and the reference electrode 38. The current supply circuit 14 controls the frequency of the pulse-shaped current signal Sif corresponding to a difference between an the electromotive force V2 measured by ~~said~~the electromotive force-measuring circuit 70 and the comparing voltage Vb. The pulse-shaped current signal Sif which is frequency-controlled on the basis of the electromotive force V2, is allowed to flow from the outer pumping electrode 30 to the detecting electrode 60. The measuring system 64 converts at least the frequency of the pulse-shaped current signal Sif into a concentration of NOx.

Please replace the paragraph beginning at page 26, line 3, with the following rewritten paragraph:

A first external output terminal ϕ_01 electrically connected to the detecting electrode 60, a second external output terminal ϕ_02 electrically connected to the reference electrode 38 and a third external output terminal ϕ_03 electrically connected to the outer pumping electrode 30 are led to the outside of the main sensor device 12 respectively. As shown in FIG. 3, the first and second external output terminals ϕ_01 , ϕ_02 are connected to input terminals of the electromotive force-measuring circuit 70 respectively. ~~t~~The first and third external output terminals ϕ_01 , ϕ_03 are connected to first and second input terminal ϕ_{i1} , ϕ_{i2} of the current supply circuit 14 respectively. Thus, the main sensor device 12, the electromotive force-measuring circuit 70 and the current supply circuit 14 are electrically connected to one another.

Please replace the paragraph beginning at page 28, line 2, with the following rewritten paragraph:

~~An~~ output terminal of the driving circuit 80 is electrically connected to a negative terminal of the power supply 81. A positive terminal of the power supply 81 is electrically

connected to the outer pumping electrode 30 via the second input terminal ϕ_{i2} of the current supply circuit 14 and the third external output terminal ϕ_{o3} of the main sensor device 12.

Please delete the paragraph beginning at page 61, line 8:

— The gas sensors 10A to 10C according to the first to third embodiments described above (including the respective modified embodiments) are illustrative of the application to the control of the measuring pumping cell 62 including the outer pumping electrode 30 and the detecting electrode 60. Besides, the present invention is also applicable to control the auxiliary pumping cell 52 and the main pumping cell 32. Especially, the present invention is extremely effective when the main pumping cell 32 is subjected to the correcting control so that the current value of the auxiliary pumping cell 52 is constant, because of the following reason.

Please delete the paragraph beginning at page 61, line 20:

— That is, a slight detection error acts as a factor of malfunction, because the pumping current of the auxiliary pumping cell 52 is not more than several μA . However, the application of the gas sensors 10A to 10C according to the first to third embodiments (including the respective modified embodiments) makes it possible to detect the pumping current as the frequency, the pulse width, or the voltage value in a large range. Thus, the present invention is effective to eliminate the detection error.